Definition 0.1. A *fundamental quantum groupoid* $F_{\mathcal{Q}}$ is defined as a functor $F_{\mathcal{Q}} : \mathcal{H}_B \to \mathcal{Q}_G$, where $\mathcal{H}_B$ is the category of Hilbert space bundles, and $\mathcal{Q}_G$ is the category of *quantum groupoids* and their *homomorphisms*.

0.0.1 Fundamental Groupoid Functors and Functor Categories

The natural setting for the definition of a *quantum fundamental groupoid* $F_{\mathcal{Q}}$ is in one of the functor categories– that of fundamental groupoid functors, $F_{\mathcal{G}}$, and their natural transformations defined in the context of quantum categories of quantum spaces $\mathcal{Q}$ represented by Hilbert space bundles or 'rigged' Hilbert (or Frechét) spaces $\mathcal{H}_B$.

Other related *functor categories* are those specified with the general definition of the *fundamental groupoid functor*, $F_{\mathcal{G}} : \mathbf{Top} \to \mathcal{G}_2$, where **Top** is the category of topological spaces and $\mathcal{G}_2$ is the groupoid category.

Example 0.1. A specific example of a quantum fundamental groupoid can be given for spin foams of spin networks, with a spin foam defined as a functor between spin network categories. Thus, because spin networks or graphs are specialized one-dimensional CW-complexes whose cells are linked quantum spin states, their quantum fundamental groupoid is defined as a functor representation of CW-complexes on 'rigged' Hilbert spaces (also called Frechét nuclear spaces).

http://planetphysics.us/encyclopedia/FundamentalQuantumGroupoid.html